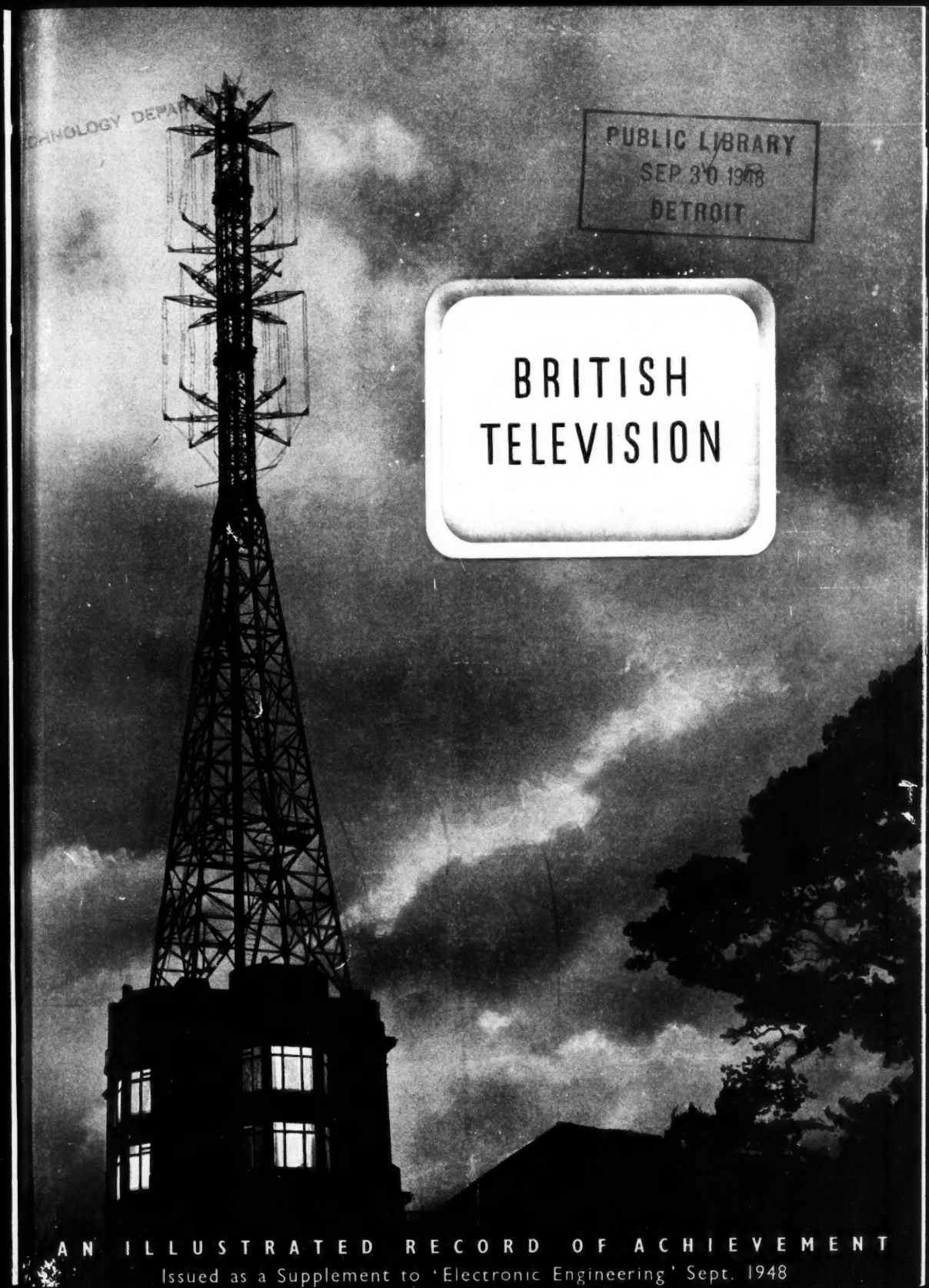
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DETROIT
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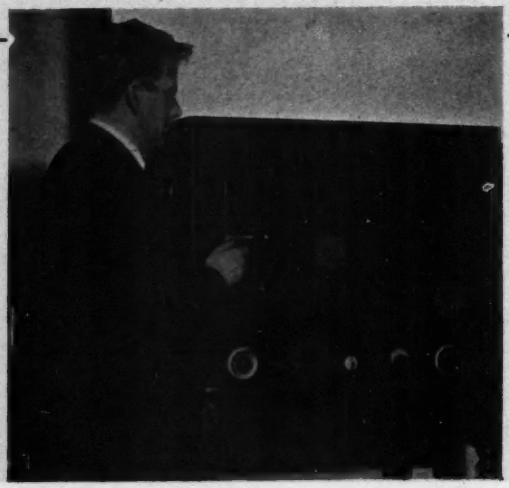
TELEVISION
AN ILLUSTRATED RECORD OF ACHIEVEMENT
Issued as a Supplement to 'Electronic Engineering' Sept. 1948



J. L. Baird, the British television pioneer with an early model of a television receiver

The picture was seen in the hooded opening on the left of the cabinet

THE HISTORY OF BRITISH TELEVISION

A GLASS case containing an arrangement of crude disks and lenses stands in the Science Museum at South Kensington with a label which states that it is the transmitting portion of the original apparatus used by J. L. Baird in experiments which led him to the achievement of television on January 27, 1926, this being the first demonstration of true television ever given.

John Logie Baird was not, as many imagine, the inventor of television. The earliest proposals were made before he was born, and several inventors had filed applications for patents which anticipated his ideas in many respects. But he made the crucial advance which put him above his predecessors—he made the ideas work. From the commencement of his experiments in 1923 this unknown Scottish inventor had complete faith in the ultimate success of television, and when he died in 1945 it was with the realisation that his original demonstration had laid the foundation of the first commercial television service in the world.

The years 1926 to 1929 were marked by other pioneer experiments. An image was transmitted by telephone cable between London and Glasgow in May, 1927. In February, 1928, the Atlantic was crossed and a recognisable picture was received by radio in New York. In August, 1928, a simple coloured picture was shown, and, at length, in September, 1929, an experimental broadcast service was inaugurated by the B.B.C. and The Baird Company. A dual transmission was started in March, 1930, on a wave-length of 261 metres (vision) and 356 metres (sound) for half-an-hour daily and, in August, 1932, the programmes were taken over wholly by the B.B.C. and a mirror drum scanner was installed at Portland Place.

It was recognised that television would have little entertainment value until the definition of the picture had considerably improved. The Baird system utilised only 30 scanning lines repeated 12½ times per second, which limited its field to close-up shots and bold contrasty scenes. During the era of the low-definition transmissions experimental work had been undertaken by several companies in Britain and America to eliminate the mechanical system of scanning and produce a picture which would compare favourably with the cine film.

An all-electronic system had been proposed as early as 1908 by A. A. Campbell Swinton (in a letter to *Nature*, June 18). He conceived the idea of a photo-electric mosaic screen, on which the image of the scene could be focused, the screen being then scanned by cathode rays deflected by a varying magnetic field. Those familiar with modern television transmission will realise that Campbell Swinton's suggestion has been borne out in almost every detail by the system now in use. The practical realisation of the scheme was carried out by V. K. Zworykin in America, and by McGee, Blumlein, and others of Electrical and Musical Industries Ltd., in Britain.

In 1936 the first high-definition transmission of television pictures took place from the B.B.C. station at Alexandra Palace. At the commencement of the service two standards were adopted, one of 240 lines, 25 pictures per second from the Baird Company's transmitter, and the other of 405 lines 25 pictures per second interlaced from the E.M.I. transmitter. After a short trial period, a choice was finally made in favour of the second system, which was put into permanent operation in February, 1937.

Apart from the unavoidable break during the war, Britain has thus enjoyed a daily programme of television entertainment for many years, and the experience gained both in producing and receiving these programmes has given British engineers a lead which they are confident of being able to maintain.

THE B.B.C. TELEVISION SERVICE

THE London Station of the B.B.C. Television Service is situated at Alexandra Palace, which stands on a hill in north London, 300 feet above sea level. On the south-east tower of the Palace an aerial mast another 300 feet in height has been erected, a view of which is seen on the cover of this booklet.

Two aerial systems, the upper for vision and the lower for sound, are mounted at the top of the mast structure. Each aerial array consists of eight dipole elements equally spaced around the mast, with eight similar reflectors to ensure uniform radiation and avoid losses in the mast.

Vision Transmitter

The vision signal is transmitted on a wavelength of 45 Mc/s. with a band width of 3 Mc/s. When full carrier output is being transmitted, *i.e.*, on white signals, the output is 17 KW, supplied by two water-cooled CAT.9 valves in push-pull. The carrier frequency is maintained constant within 1 part in 20,000 and is obtained from a master oscillator of 22.5 Mc/s. followed by a single frequency-doubling stage. The amplified R.F. is then applied through an intermediate push-pull stage to the final power amplifier, which is grid-modulated by the vision signal.

Sound Transmitter

The sound transmitter has a peak rating of 12 KW and is operated on a frequency of 41.5 Mc/s. The frequency response of the transmitter is flat between 30 and 10,000 c/s., which accounts for the high quality of reproduction for which the television service is noted.

Vision Signal

Each of the four Emitron cameras in the studio is connected with the control room through a multi-core cable, which carries both the vision signal and the supplies for operating the camera.

The basis for the scanning is a master oscillator of 20,250 c/s., which supplies sub-multiple frequencies of 10,125 and 50 c/s. for the line and frame scan respectively. In addition to generating the scanning waveforms for the camera, the master oscillator provides the synchronising impulses which are added to the vision signal at a later stage in the amplifying chain.

After passing through suitable correction circuits, the vision signal enters a mixer unit which receives the outputs from the cameras. This enables any desired scene to be selected, or mixed with that from another camera. It is also possible to display the scene from one camera on a monitor tube while another camera is on the air (see photograph on next page).

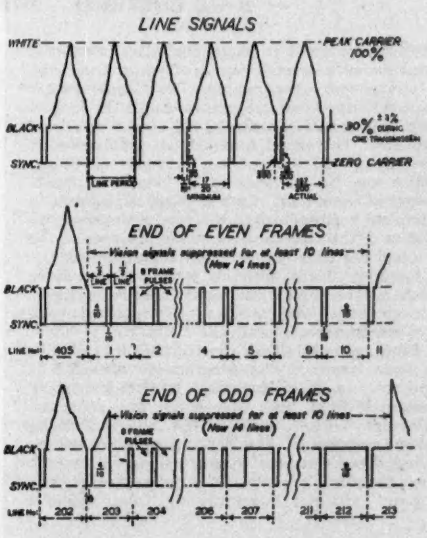
Vision Waveform

A characteristic of the British television system is that a "positive" signal is radiated, *i.e.*, the amplitude of the carrier wave is proportional to the picture brightness at any instant, and a maximum carrier corresponds to full white in the picture.

In order to provide for a synchronising signal which can be readily separated from the vision signal, the level of the carrier wave corresponding to black in the picture only falls to a height of 30 per cent. above zero (see diagram). The establishing of this "black level" is an important feature of the system, as it not only enables the synchronising pulses to be separated from the vision signal by a simple form of amplitude filter, but also ensures that the relative tones of the picture are correctly rendered on the receiving screen.

A second important feature, which is common to all modern high-definition systems, is the use of interlaced scanning. If the picture were scanned completely 25 times a second, it would give rise to an objectionable flicker which could only be removed by increasing the scanning rate to 50 per second or more. This, however, would entail an increase in the band-width transmitted, with economic difficulties in the design of transmitter and receivers. The interlaced scanning system gives the effect of 50 pictures per second with an actual repetition rate of 25 per second, in the following way :

The picture is scanned with half the total number of lines (202½) in 1/50th second to form one "frame," a gap being left between each line equal to the thickness of a line. At the completion of this scan the spot returns to the beginning of its travel and draws the second set of 202½ lines in the spaces left between the first set. The eye thus receives the impression of a complete picture scanned 50 times per second, as it does not notice the interval between adjacent lines. The diagram of the waveform at the end of the even and odd frames shows how the scanning spot is displaced by half a line to enable the interlacing to be accomplished.



The control desk in the vision transmitter hall. In front of the control engineer is a waveform monitor tube, and the actual picture transmitted is seen on a screen beyond the desk

BEHIND THE SCENES

FROM the aerial at Alexandra Palace is radiated all the wide variety of scenes which go to make up the television programme. The "inside work"—plays, interviews, cabaret, or ballet—is done in two 70-foot studios with the aid of four television cameras. The sound is picked up simultaneously by moving coil microphones mounted on booms which can be manoeuvred to follow the movements of the artists. One of these can be seen in the picture opposite, and it is one of the responsibilities of the staff to see that the presence of the microphone does not intrude on the picture.

Lighting of the scene is more in accordance with a film studio than with theatre practice, though very little make-up is required with modern Emitron cameras.

Films are used either as auxiliaries to a play or as main items on the programme. The B.B.C. operates its own Newsreel Service and many newsreels have been shown on the American television system within a few hours of being taken over here. The film scanning equipment differs from the usual type of cine projector in that the film is run continuously through the "gate" and not intermittently. An ingenious system of mirrors follows the movement of the film and projects a stationary image on to the screen of an Emitron camera in the projection room.

The most popular television programmes are those which bring outside events directly to the viewer's sitting-room, and the Outside Broadcast Unit has a deservedly high reputation for the quality of the pictures transmitted from sites outside the Palace.

A specially balanced cable connects the Palace with a number of strategic points in Central and South West London, and this is used for direct transmission of scenes wherever convenient.

Where the cable is not available, the O.B. Unit provides its own transmitting link, and radiates a signal from a mobile aerial installed on the site. This is carried on a telescopic mast which can be extended to 100 feet, and which carries a horizontal dipole. The signal is radiated to a receiving station at Highgate, whence the vision signal is relayed by cable to Alexandra Palace. The O.B. fleet comprises a mobile control room (or "scanner"), transmitter van, aerial van, a mobile generator, and two auxiliary vehicles, making an imposing procession when on its way to the site.

An actor's viewpoint of the studio during a performance. Between two cameras stands the Studio Manager giving the cue, while engineers bring up auxiliary lights or move the microphone boom

THE PROGRAMME GOES OUT

PROGRAMMES are transmitted every day of the week, Sundays included, with sessions each afternoon and evening. Afternoon programmes run for approximately an hour, from 3 to 4 p.m., with extensions in the case of plays or special "outside" broadcasts. Evening programmes extend from 8.30 to 10.00 p.m. In addition, a demonstration film is transmitted between 11 a.m. and 12 every weekday morning for the benefit of the radio industry.

Studio programmes cover a wide range of interests. Plays, averaging about 2½ weekly, are perhaps the most popular, but the transmissions include the weekly editions of "Picture Page" (interviews with people in the news), documentaries, illustrated talks, dance and variety shows, ballet, sporting interviews, demonstrations of wrestling and boxing, newsreels made by the B.B.C.'s own film unit, and many short films.

Studio shows are supplemented by outside events provided by two mobile television units, which can range London and the home counties to distances of up to 30 miles from Alexandra Palace. In sport they have covered racing at Ascot, tennis at Wimbledon, cricket at Lords and the Oval, football at Wembley, rugger at Twickenham, the Boat Race and the Olympic Games. In national events they have given viewers "actuality" pictures of the Victory Parade, Lord Mayor's Show, the Royal Tour to South Africa, and the Royal Wedding—to name only a few.

Staff

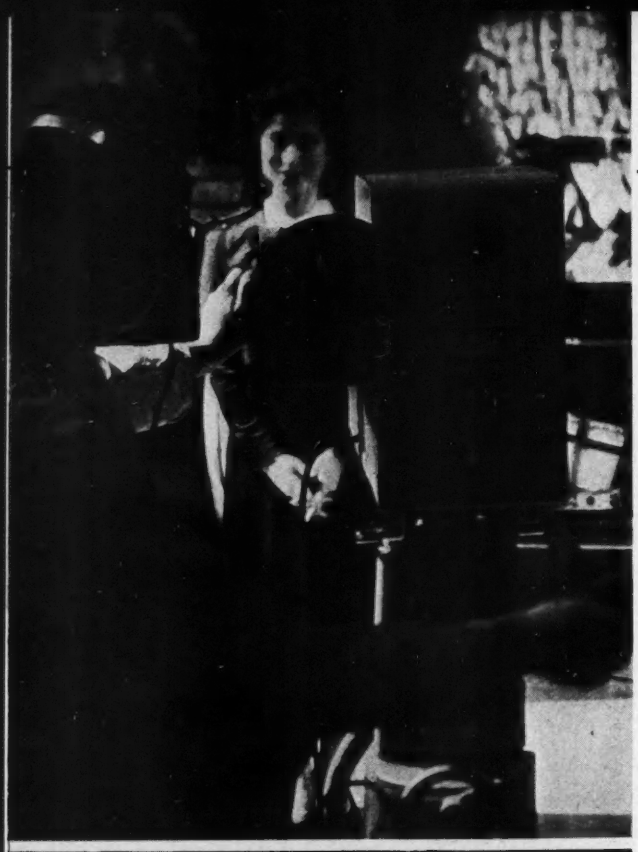
The head of the Television Service is Norman Collins, formerly in charge of the Light Programme, and author of "London Belongs to Me," the successful book and film.

The programme director is Cecil McGivern, formerly a B.B.C. feature writer, and the programme organiser is Cecil Madden.

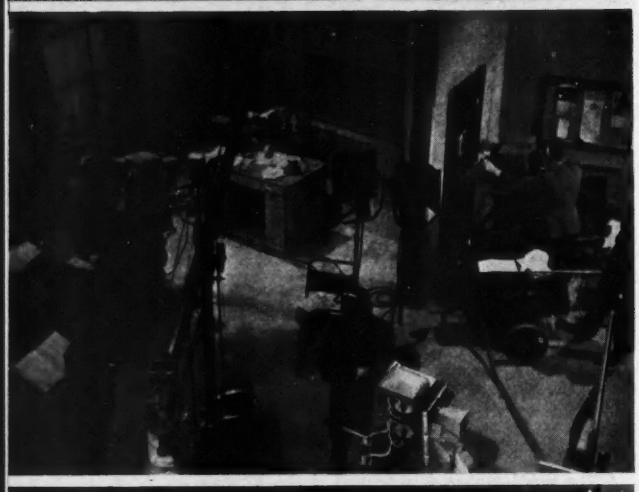
Outside broadcasts and films are controlled by Philip Dorté, O.B.E., and Ian Orr-Ewing, O.B.E. The total number of producers is about twenty, and the programme staff numbers 300.

On the engineering side, the superintendent engineer is D. C. Birkinshaw, M.B.E., and the engineer-in-charge of studios is H. Baker. T. H. Bridgewater is in charge of outside broadcasts, and the engineering and technical staff numbers over 200.

TEAMWORK . . .



The cameraman's view of the artiste. The viewfinder on the side of the Emitron camera shows an upside-down image which must be kept continually in focus. Headphones enable the operator to receive instructions from the producer



A scene on the studio floor during the production of a thriller. While the detective sits at the desk being televised by the camera on the left, another camera (right) waits to approach through the door, seeing him as with the eyes of a person calling on him

Watching three scenes at once from the control room

The control engineers adjusting the correction circuits during the programme, with pre-views of the scenes ready to go on the air

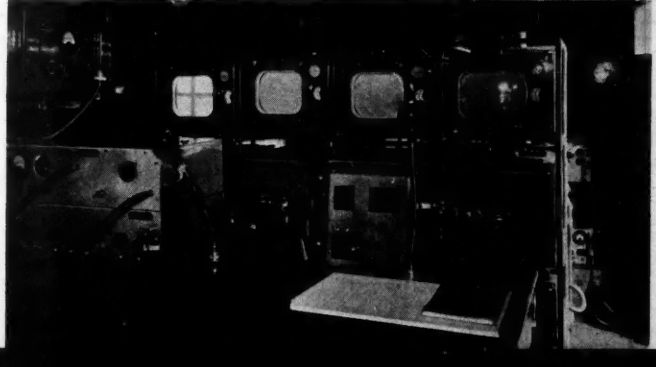
. . . CONTROL

A study in intentness. Group in the production gallery controlling the transmission

The producer and engineers are studying . . . . . .

. . . the pre-view and transmission monitor screens, with a window overlooking the studio on the right. Instructions can be given to the mixers or studio staff through the microphones on the desks

The Central Control Room where the individual items from the studio film room or outside broadcasts are blended to form a complete programme



Interior of the new E.M.I. mobile television control room which was first used for televising the events at the Empire Pool, Wembley on the occasion of the Olympic Games

STAGE AND SCENE

" There's rosemary—that's for remembrance "
One of the most successful television productions of recent times was a full-length version of " Hamlet," for which the producer, G. More O'Ferral received the Television Society's medal
Left to right : Laertes (Patrick Macnee), Ophelia (Muriel Pavlow), The King (Sebastian Shaw), The Queen (Margaret Rawlings), Horatio (Patrick Troughton)

Televising the Olympic Games. The main television camera is focused on the competitors in the 10,000 metre walk in the Empire Stadium at Wembley. The O.B. unit broke all previous records with a total of 68 hours transmission in addition to the normal programmes

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